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(54) Rendering intent selection based on input color space and object type

(57) The invention provides a method for processing a document to be rendered in which rendering intent selection is based on input color space. In one aspect, the method includes the following steps: a) identifying an object type for an object in the document (16); b) identifying an input color space of the document (18); c) selecting a rendering intent for the document based on the object type and the input color space (20); and d) processing the document using the selected rendering intent (22). In another aspect, the method includes the following steps: a) identifying an object type for each object in the document (16); b) identifying an input color space of the document (18); c) selecting a rendering intent for each object in the document based on the object type and the input color space (20); and d) processing the document using the selected rendering intent(s) (22).

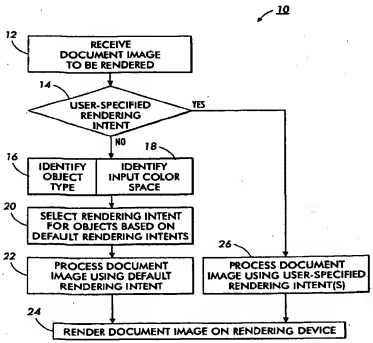

FIG. 1

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Description

BACKGROUND OF INVENTION

[0001] The Invention relates to rendering Intent selection for document image processing. It finds particular application in conjunction with rendering Intent selection based on input color space and will be described with particular reference thereto. However, it is to be appreciated that the invention is also amenable to other applications.

[0002] As users of color products become more and more skilled, requirements for control over the image path in a digital front end (DFE) of a image processing system become more pronounced. One example of this is rendering intent selection during image processing of a document image to be rendered. For example, DocuSP 3.0, the Xerox Common Controller/DFE, currently selects rendering intent for document images based on object type.

[0003] Rendering intents are simply methods (i.e., sets of rules) for converting colors from one color space to another. They are a standard part of the ICC (International Color Consortium) profile format commonly used in existing color-management systems.

[0004] The ICC profile specification defines various rendering intents, including: 1) absolute colorimetric rendering, 2) relative colorimetric rendering, 3) perceptual rendering, and 4) saturation rendering. The rendering intent being used during image processing of a document image defines how colors are mapped from the input color space to the output color space.

[0005] Typically, graphics data is processed through the saturation rendering intent to produce vivid output, while images are processed through the perceptual rendering intent to produce true to life pictorials. Such system-specified defaults are available in image processing systems so that users do not need to specify the rendering intent for the document image or for each object type.

[0006] Where current mechanisms in color image processing select default rendering intents based on object type, an RGB graphic and a CMYK graphic are rendered through the same rendering intent. This may not always be desirable from the customer perspective.

BRIEF SUMMARY OF INVENTION

[0007] Therefore, and as now not existing, to produce optimal image quality, it would be desirable to add a capability in the image processing system to select rendering intent based not only on object type, but also on input color space.. For example, image data may be processed so that CMYK graphic data is rendered through a colorimetric rendering intent to preserve the accuracy of colors, while RGB graphic data on the same page is rendered through a perceptual intent to produce a more pleasing output.

[0008] Thus, there is a particular need for selection of rendering intent based on input color space. The invention contemplates a method for selection of rendering intent based on input color space that overcomes at least one of the above-mentioned problems and others.

[0009] In one aspect of the invention, a method for processing a document to be rendered is provided. The method includes the following steps: a) identifying an object type for an object in the document; b) identifying an input color space of the object; c) selecting a rendering intent for the object based on the object type and the input color space; and d) processing the object using the selected rendering intent.

[0010] In another aspect of the invention, a method for processing a document to be rendered is provided. The method includes the following steps: a) identifying an object type for each object in the document; b) identifying an input color space of the document; c) selecting a rendering intent for each object in the document based on the object type and the input color space; and d) processing the document using the selected rendering intent(s).

[0011] Benefits and advantages of the invention will become apparent to those of ordinary skill in the art upon reading and understanding the description of the invention provided herein.

BRIEF DESCRIPTION OF DRAWINGS

[0012] The invention is described in more detail in conjunction with the accompanying drawing.

[0013] FIG. 1 shows a method for selection of rendering intent based on input color space.

DETAILED DESCRIPTION

[0014] While the invention is described in conjunction with the accompanying drawing, the drawing is for purposes of illustrating exemplary embodiments of the invention and is not to be construed as limiting the invention to such embodiments. It is understood that the invention may take form in various components and arrangement of components and in various steps and arrangement of steps beyond those provided in the drawings and associated description.

[0015] With reference to FIG. 1, a method 10 for selection of rendering intent based on input color space is provided. The method begins when a document image to be rendered is received 12. Next, a determination is made whether the user will specify the rendering intent 14. However, in a system where the user is not permitted to specify the rendering intent, step 14 may be excluded or bypassed. If the user will not specify the rendering intent, object types for objects in the document image are identified 16 and the input color space for the document image is identified 18. Next, a rendering intent is selected for each object in the document image based on system default rendering intents 20. The system default rendering intents are based on input color space and object type. For example, the following table identifies a possible set of system default rendering intents by object type.

	CMYK	RGB	CIELAB
Text	Relative Colorimetric	Saturation	Saturation
Graphics	Relative Colorimetric	Saturation	Saturation
Images	Relative Colorimetric	Perceptual	Perceptual
Sweeps	Relative Colorimetric	Saturation	Saturation

Alternative arrangements for default rendering intents are possible, particularly in systems where additional object types and additional input color spaces are available.

[0016] After system-specified rendering intents are selected, the document image is processed using the default rendering intents 22. Then, the processed document image is rendered on a rendering device 24.

[0017] In step 14, if the user specifies the rendering intent, the user selects the rendering intent(s) and the document is processed using the user-specified rendering intent(s) 26. Then, the processed document is rendered on a rendering device 24.

[0018] Implementation of the input color space rendering intent selection is an extension of Xerox's current DocuSP architecture. In this type of architecture, the rendering engine acts as the Color Management Module, and currently selects the rendering intent based on object type. Rendering intent values may be system (default) or user-specified. As a color document is decomposed and rendered, the rendering engine is aware of the input color space of each object in the PDL, and uses this information to further extend the selected rendering intent(s).

Claims

1. A method for processing a document to be rendered, comprising the following steps:

   a) identifying an object type for the document;
   b) identifying an input color space of the document;
   c) selecting a rendering intent for the document based on the object type and the input color space; and
   d) processing the document using the selected rendering intent.

2. The method as set forth in claim 1, further comprising the following step before step a):

   e) receiving a document to be rendered.

3. The method as set forth in claim 1, further comprising the following steps:

   e) before step a), determining if a user-specified rendering intent is selected;
   f) proceeding to step a), if a user-specified rendering intent is not selected, otherwise processing the document using the user-specified rendering intent.

4. The method as set forth in claim 1, step c) further comprising the following step:

   e) if the input color space is CMYK, selecting a relative colorimetric rendering intent.

5. The method as set forth in claim 1, step c) further comprising the following step:

   e) If the input color space is RGB and the object type is text, graphics, or sweeps, selecting a saturation

rendering intent.

6. The method as set forth in claim 1, step c) further comprising the following step:

e) if the input color space is RGB and the object type is image, selecting a perceptual rendering intent.

7. The method as set forth in claim 1, step c) further comprising the following step:

e) if the input color space is CIELAB and the object type is text, graphics, or sweeps, selecting a saturation rendering intent.

8. The method as set forth in claim 1, step c) further comprising the following step:

e) if the input color space is CIELAB and the object type is image, selecting a perceptual rendering intent.

9. A method for processing a document to be rendered, comprising the following steps:

a) identifying an object type for each object in the document;
b) identifying an input color space of the document;
c) selecting a rendering intent for each object in the document based on the object type and the input color space; and
d) processing the document using the selected rendering intent(s).

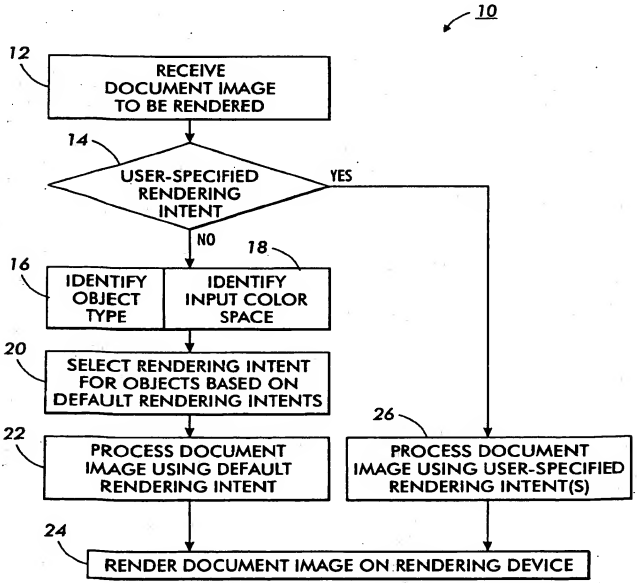

FIG. 1

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EUROPEAN SEARCH REPORT

Application Number
EP 04 00 0526

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X	US 5 872 895 A (GUAY RANDALL G ET AL) 16 February 1999 (1999-02-16) * abstract * * figures 1,4,5 * * column 1, line 57 - line 67 * * column 2, line 66 - column 3, line 35 * * column 4, line 15 - line 29 * * column 5 - column 6 * * claims 1,4 *	1-3,5,6,9	H04N1/60
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Y	WO 95 31794 A (APPLE COMPUTERS INC ;SWEN IUE NA STEVE (US); STOKES MICHAEL D (US)) 23 November 1995 (1995-11-23)	4	
A	* page 3, line 15 - line 19 * * page 4, line 20 - page 6, line 7 * * page 12, line 11 - line 15 * * page 19 *	1-3,5-9	
A	EP 1 014 687 A (EASTMAN KODAK CO) 28 June 2000 (2000-06-28) * column 6, line 33 - line 42 * * column 12, line 56 - column 13, line 7 *	1-9	TECHNICAL FIELDS SEARCHED (Int.Cl.7) H04N
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A	EP 1 152 373 A (XEROX CORP) 7 November 2001 (2001-11-07) * claims 1,9,10 * * paragraph [0017] * * paragraph [0024] - paragraph [0025] *		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	15 April 2004	Le Gleut, R

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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EPO FORM 1503 03.82 (P04C01)

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

INTERNATIONAL SEARCH REPORT

Internat ' Application No
PCT/US 95/13013

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G06T11/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 G06T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	EP,A,0 665 676 (HEWLETT PACKARD CO) 2 August 1995 see page 2, line 42; figure 3 ---	1,3,5,6, 9-11
X	COMPUTER SHOPPER, vol. 14, no. 6, June 1994 page 355 XP 000563415 O'MALLEY 'color printing gets smarter hues' * The whole document * ---	1,6,10
A	EP,A,0 606 781 (CANON KK) 20 July 1994 see claim 1 -----	1-13

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
19 February 1996	08.03.96

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax (+ 31-70) 340-3016	Perez Molina, E

INTERNATIONAL SEARCH REPORT

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Internat l Application No
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